REMARKS

Overview

Claims 1, 2, 4-33, 47, 67-74, and 85 have been amended. Support for these amendments can be found in the published Specification at paragraphs 10, 15-16, 82, 86, 89, 91, 135, 141, and 202. Claims 6-33, 75-84 and 86-98 are withdrawn. Although amended, please note that claims 6-33 and 75 were previously withdrawn. New claim 99 has been added. Support for this additional claim may be found, for example, in originally-filed claims 75, 80 and 4. No new matter has been added. Upon entry of this amendment and new claim 99, claims 1-99 are pending and claims 1-5, 34-74, 85 and 99 are under consideration. Applicants have submitted a Rule 132 Declaration in response to the section 112 rejection. The present response is an earnest effort to place all claims in proper form for immediate allowance. Reconsideration and passage to issuance is therefore respectfully requested.

Election/Restrictions

The Examiner acknowledges Applicant's election of Group I, claims 1-74 and 85, without traverse.

Pursuant to a telephone conversation between the Examiner and Applicants' attorney Heidi Nebel on December 2, 2006, a provisional election was made with traverse to prosecute the species of A549 cells provided in claims 1-74 and 85. Applicants respectfully submit that claims 1-3, 66-67 and 85 read on the elected species. When a generic claim is held to be allowable, Applicants are entitled to consideration of additional species. MPEP § 809.02(c). Applicants hereby affirm this election and withdraw claims 6-33 from further consideration pursuant to 37 C.F.R. §1.142(b), but request examination of the withdrawn, additional species when the generic claims are held allowable. The Examiner indicated that claims 1-3, 66, 67 and 85 are generic. Applicants also note that withdrawn process claim 75 (currently amended) is also generic and ask that it be rejoined when the product claims are found to be allowable. MPEP § 821.04

Claim Objections

A. Claim 47 is objected to because there appears to be a typographical error. Claim 47 is listed as "claim 4".

Applicants have amended the claim to correct this typographical error.

B. Claim 85 is objected for depending on claim 75, which is a non-elected claim and withdrawn from consideration. The Examiner states claim 85 should be amended to include all of the limitations of claim 75.

Applicants thank the Examiner for this suggestion and accordingly have amended the claims to include all the limitations of claim 75. In light of the above, Applicants request that the objections to claims 47 and 85 be withdrawn.

Claim Rejections Under 35 U.S.C. § 112

Claims 34-65 and 68-74 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not set forth in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

A. The Examiner writes that the claims 34-65 and 68-74 are drawn to compositions comprising specific cell lines that do not appear to be commercially available and that the specification fails to provide enough information for one of skill in the art to produce cell lines with exactly the same characteristics as the cell lines of claims 34-65 and 68-74.

Applicants respectfully traverse these grounds for rejection. First, these cell lines are commercially available from NewLink Genetics Corporation, Ames, Iowa as reagents for research use only.

Second, one of skill in the art would be able to reproduce the claimed compositions by using the reagents and following the methods described in the specification using well known techniques available prior to the priority filing date of the present application and following the teachings of the specification. As shown in the Declaration, Applicants have produced cell lines with exactly the same characteristics as the cell lines in the claims of 34-65 and 68-74. The vaccine cell compositions of claims 34-65 and 68-74 are all derived from cell lines that are commercially available from ATCC, for example, MCF7 is available under ATCC catalog no. HTB-22, A549 is available under ATCC catalog no. CCL-185, and BT20 is available under ATCC catalog no. HTB-19. Table 1 of the specification indicates the identity of the cell lines used to prepare each one of the vaccine cell compositions of claims 34-65 and 68-74 and the ATCC catalog number. Example 1 of the specification gives detailed description of how to produce retroviral supernatants from the alpha—(1,3)-galactosyltransferase encoding vector pLNCKG. Example 2 gives detailed protocols about how to transduce a cell line with retroviral vector pLNCKG. Example 12 gives detailed description of how to perform transduction of the listed human cell lines to generate HYPERACUTE™ vaccines. Example 12 also describes the anti-αGal antibody and its commercial source used to stain transduced cells for FACS sorting. The remainder of Example 12 describes how to generate master cell banks, working cell banks and production lots from these cell lines. Therefore, a person of skill in the art would be able to reproduce the compositions of the present invention without undue experimentation.

The Examiner also states that even if the specification provided enough information for one of skill in the art to produce the cell lines similar to those of claims 34-65 and 68-74, the reproduction of identical cell lines would be an unpredictable event. In further support of the teachings of the specification and in response to this rejection, the Applicants are submitting herewith a Rule 132 Declaration by Dr. Gabriela Rossi, one of the inventors of the present application, a Senior Scientist for NewLink Genetics Corporation, Ames, Iowa . Applicants submit Exhibit B to show that the teachings of the specification result in the production of several HYPERACUTE vaccine cell lines HAB1, HAL1 and HAB2. The Declaration contains data from FACS analysis of cell lines HAB1, HAL1 and HAB2 transduced with pLNCKG vectors for the expression of αGal on their cell surface. See Exhibit B attached thereto. The inventor used commercially available cell lines MCF7, A549, and BT20 to generate HAB1, HAL and HAB2. The cells were transduced, selected for resistance to Neomycin, stained with anti-αGal antibody and analyzed by FACS. Two independent transductions, αGal staining and FACS analysis were done for each cell line. The intensity of αGal staining obtained by FACS demonstrate that consistent with the assertions in the specification, the making of these cell lines are possible, reproducible, and not unpredictable as concluded by the Examiner.

Accordingly, the specification and the Declaration demonstrate that one of skill in the art, relying on the present disclosure, the provided starter cell lines and on knowledge in the art at the time the present application was filed, would be able to produce the cell lines used in the compositions of the present invention. Thus, the specification and the Declaration demonstrate that the claims of the invention are enabled for producing cell lines used in the claims.

Therefore, the Examiner has not provided a rational basis as to why the disclosure does not teach or why the Examiner doubts the objective truth of the statements in the disclosure that purport to teach the manner and process of making and using the invention to one of ordinary skill in the pertinent technology, the Examiner has not made out a *prima facie* case for nonenablement under 35 U.S.C. § 112, first paragraph. MPEP 2164.04.

In light of the above arguments, Applicants submit that the grounds for the § 112 rejection has been overcome. The claims of the present invention are fully enabling. Therefore, Applicants request that the rejections under 35 U.S.C. § 112 be withdrawn.

B. Claims 1-5, 66, 67, 85 stand rejected under 35 U.S.C. § 112, allegedly does not reasonably provide enablement for compositions having an intended use as vaccines, or comprising "vaccine tumor cells". The Examiner states the basis for this rejection is that the specification fails to enable one of skill in the art to use the claimed compositions as prophylactic cancer vaccines for the intended use of preventing cancer.

The Examiner states because the claims contain the word "vaccine", the implied intended use for the claimed compositions is that a prophylactic cancer vaccine, in addition to other intended uses, such as that of "stimulating an immune response". The Examiner states the specification provides no working embodiments demonstrating prevention of cancer using the claimed compositions. Therefore, the Examiner concludes that the teachings of the specification are prophetic with respect to any use as a prophylactic vaccine.

The Examiner states for methods that relate to the prevention of cancer, there is no guidance in the specification for determining the appropriate time prior to the development of tumors to begin the therapy or for identifying patients at risk for developing those tumors.

Applicants traverse this rejection. Applicants respectfully submit that the Examiner takes an overly narrow meaning of the word "vaccine". Even though one meaning of vaccine is associated with a composition to prevent development of infectious diseases, many vaccines are also used in therapeutic settings, even for certain infectious diseases such as rabies and Hepatitis B. In fact, the definition of vaccine according to Oxford American Dictionaries is "a substance used to stimulate the production of antibodies and provide immunity against one or several diseases, prepared from the causative agent of a disease or a synthetic substitute" submitted herewith for the Examiner's consideration. Also, according to Encarta Dictionary (North American English) a vaccine is "a preparation containing weakened or dead microbes of the kind that cause a particular disease, administered to stimulate the immune system to produce antibodies against that disease". Thus, the word "vaccine" is used by Applicants in its ordinary, dictionary meaning which does not inherently include timing of its use.

Applicant's specification describes a vaccine that can be used both for preventive or therapeutic settings. Applicant's Example 6 in the specification describes the prevention of subcutaneous tumor development by prophylactic vaccination with $\alpha\mathrm{Gal}^{(+)}$ cells and Figures 14 and 15 demonstrate $\alpha\mathrm{Gal}^{(+)}$ vaccines are more effective than $\alpha\mathrm{Gal}^{(-)}$ vaccines in a prophylactic vaccination scheme. Examples 7 and 8, demonstrate that this vaccine is also effective in a therapeutic setting. Therefore the specification demonstrates that these cancer vaccines are effective in both a preventive or therapeutic vaccination setting and provides guidance to one skilled in the art to predict the efficacy of the claimed methods and composition with a reasonable expectation of success.

The specification, among others, enables a person of ordinary skill in the art to make and use the invention commensurate with the scope of claims. While not acquiescing to the

Examiner's arguments, Applicants have amended the claims to remove the word vaccine and to recite "A therapeutic composition." Support for this amendment may be found in the specification, for example, at paragraphs 10, 15, 16, 89, 91, 93, 110-113, 135, and 202. Applicants respectfully request that this rejection be withdrawn and reconsidered.

Claims Rejections Under 35 U.S.C. § 102

A. Claims 2 and 85 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by LaTemple (LaTemple, D.C. et al., Cancer Research, 59:3417-3423, 1999; cited in IDS).

The Examiner states LaTemple teaches compositions comprising irradiated BL6 murine melanoma cells that have been transformed with murine α(1,3) galactosyltransferase cDNA and that continuously expresses α-gal epitopes (see pages 3418, 1st column and page 3419, 1st column). The Examiner states, therefore, LaTemple teaches compositions that are the same as that claimed.

To anticipate, the prior art must contain each and every limitation in the claim. As amended, claims 2 and 85 recite: "human tumor cells ... allogeneic to the patient." Support for this amendment can be found throughout the Published Specification, for example, at paragraphs 135 and 141.

In contrast, as stated in the Office Action dated January 3, 2007, at page 11, LaTemple teaches the use of syngeneic murine melanoma cells used in a tumor prophylactic setting. Thus, the LaTemple reference does not teach or suggest a pharmaceutical composition comprising allogeneic human tumor cells and does not describe methods for manufacturing clinically and pharmaceutically acceptable therapeutic tumor vaccines. Thus, LaTemple fails to teach each element of independent claims 2 and 85 because Applicants teach a pharmaceutical composition comprising human tumor cells. Therefore, Applicants request that the rejection to claims 2 and 85 under 35 U.S.C. §102(b) be withdrawn and reconsidered.

B. Claim 85 stands rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Link, Jr. (Link, Jr. et al., US 5,869,035; issued Feb. 9, 1999).

The Examiner states that, Link Jr. '035 patent teaches compositions that are the same as that claimed.

Applicants traverse this rejection as it pertains to amended claim 85 which now recites the additional step of "attenuating said cells by irradiation". Support for this amendment may be found throughout the specification, for example, in original claims 80 and 93, and at paragraphs 82 and 86 in the published specification.

While the Examiner states that Link, Jr. '035 teaches A375 cells that have been transformed with α(1,3) galactosyltransferase cDNA and then killed by treatment with human complement (see col. 15, lines 1-29), the reference does not teach attenuating the transformed cells by irradiation. In fact, there would be no need to irradiate their transformed tumor cells to inhibit cell proliferation because in the '035 patent these $\alpha\text{Gal}^{(+)}$ A375 cells are not therapeutic compositions that can be used as antitumor vaccines. In fact, the only purpose of generation of $\alpha\text{Gal}^{(+)}$ A375 in the '035 patent is to demonstrate, in an in vitro experiment, that these cells can be lysed by anti-αGal antibodies and complement in order to mimic what would happen in a suicide gene therapy approach to tumor cells in vivo after introducing a gene encoding alpha(1,3)galactosyltransferase by means of a viral vector. In contrast, in claim 85 of the present invention, the αGT gene is expressed on tumor cells that have been attenuated by irradiation to avoid cell proliferation after administration to the patient. Accordingly, the '035 patent does not contain each and every limitation of amended claim 85 and, therefore, does not anticipate. Thus, Applicants respectfully request that the rejection under 35 USC §102(b) be withdrawn and reconsidered.

Claims Rejections Under 35 U.S.C. § 103

A. Claims 1-3, 67 and 85 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Galili (Galili, U. et al., Journal of Hematotherapy & Stem Cell Research 10: 501-511, 2001; cited in IDS) in view of Link, Jr., (Link, Jr. et al., US 7,005,126 B1, issued Feb. 28, 2006; effective filing date June 8, 1999) or Yoshimura (Yoshimura, N. et al., Cancer Letters, 164:155-160, 2001, March; cited in the IDS).

Applicants respectfully disagree. Applicant respectfully submits that the Office Action did not make out a *prima facie* case of obviousness because even if combined, the cited references fail to teach or suggest all of the elements of the Applicants' claimed invention. M.P.E.P. § 2142 (citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir. 1991)).

As amended independent claims 1, 2, 67 and 85 recite in part a therapeutic composition of attenuated tumor cells that are allogeneic to the patient. Support for these amendments may be found throughout the specification, for example at paragraph 202. In contrast, Galili et al describes autologous tumor cell vaccines for treating leukemias and lymphomas. The '126 patent recites xenogeneic cells for use in treating solid tumors. Yoshimura et al. merely describe the engineering of tumor cells with αGal epitopes for gene therapy but are silent with respect to the transformed tumor cells' relationship with the patient. Thus, the references do not teach or suggest using allogeneic tumor cells as recited in claims 1-3, 67 and 85 because autologous cells are cells taken from the patient and then returned to the patient and xenogeneic cells are cells from different species. In direct contrast, Applicants pharmaceutical composition comprises allogeneic tumor cells, that is, cells that are from genetically different individuals of the same species. Thus, the cited references fail to teach each and every element of Applicants' claims.

Applicants respectfully submit that the Office Action did not make out a *prima facie* case of obviousness because there is no suggestion to combine Galili et al with the '126 patent because combining them would destroy the stated purposes of Galili et al and the '126 patent.

As stated above, Yoshimura et al. merely describe engineering tumor cells with αGal epitopes but are silent with respect to the cells' relationship with the patient. Galili et al teach the use of autologous tumor cells to present tumor-associated antigens as vaccines for leukemia and lymphoma . The '126 patent teaches the use of xenogeneic cells expressing αGal epitopes to treat solid tumors. Combining Galili et al with the '126 patent by altering the '126 patent to include autologous cells rather than xenogeneic cells would destroy the stated purpose of the '126 patent to treat solid tumors via the bystander effect. Conversely, combining Galili et al with the '126 patent by altering Galili et al to include xenogeneic cells would destroy the stated purpose of Galili et al -- treating lymphomas since lymphomas are not solid tumors treatable by a hyperacute bystander effect induced by the cell compositions described in the '126 patent. Moreover, it would defeat Galili's purpose of treating lymphomas without introducing unknown pathogens carried by xenogeneic cells. Galili et al, at page 508, top of the right column. Thus, one skilled in the art would not have combined Galili et al with the '126 patent. If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d

900, 221 USPQ 1125 (Fed. Cir. 1984); MPEP § 2143.01. Thus, the cited references do not render the amended claims obvious.

Furthermore, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). MPEP 2143.01. For example, the '126 patent teaches a method for treating a solid tumor of a human subject by administering to the subject at or near the solid tumor an effective amount of murine retroviral vector producer cells having α(1,3)galactosyl epitopes, in an amount that activates a hyperacute rejection response against the xenogeneic cells and an innocent bystander immune response against tumor cells. Thus, the '126 patent teaches the use of xenogeneic αGal$^{(+)}$ cells lines that have to be injected into or very close to the solid tumor in order to cause a strong inflammatory reaction in the tumor that could lead to a collateral immune reaction. In the '126 patent, the murine αGal$^{(+)}$ cell is not the source of tumor antigens, rather the murine αGal$^{(+)}$ cell only acts as an inflammatory agent in the vicinity of the solid tumor. Thus, if one would intend to cause an immune response against lymphoma cells one would not be motivated to use the cells of the '126 patent, since these cells cannot be injected in the vicinity of a non-solid tumor to induce a bystander immune reaction that would inhibit growth of the lymphoma cells. Therefore, since combining Galili et al with the '126 patent would change the principle of operation of the prior art invention being modified, the teachings of the references are not sufficient to render the claims *prima facie* obvious.

Furthermore, not only is there no suggestion or motivation to combine these references, Yoshimura et al. in fact actually teaches away from Galili et al. Therefore, the references may be said to teach away because a person of ordinary skill, upon reading the reference, would be led in a direction divergent from the path the Applicant took. *In re Gurley*, 27 F.3d 551, 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994); *United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966); *In re Sponnoble*, 405 F.2d 578, 587, 160 USPQ 237, 244 (C.C.P.A. 1969); *In re Caldwell*, 319 F.2d 254, 256, 138 USPQ 243, 245 (C.C.P.A. 1963). Yoshimura et al teach away from the immunotherapeutic purpose described by Galili et al since Yoshimura et al conclude that "for gene therapy in cancer patients, the transfected genes should be transcribed only in the cancer cells. For this reason, designing a vector which could be transcribed exclusively in the cancer cells, is desirable". In synthesis, the authors of Yoshimura et al suggest that expression of the αGal epitopes should take place in the cancer cells that cause the disease, not that allogeneic cells transduced ex vivo could be used to induce immunity. Therefore, a person skilled in the art would not design these cells as tumor vaccines and there would be no reason to combine the '126 patent or the teachings of Yoshimura with Galili et al. to complement the deficiencies of Galili et al to arrive at the presently claimed invention. In light of the above, Applicants respectfully request that the rejections be withdrawn and reconsidered.

B. Claims 1-4 and 85 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Galili (Galili, U. et al., Journal of Hematotherapy & Stem Cell Research 10:501-511, 2001; cited in IDS) in view of Link, Jr., (Link, Jr. et al., US 7,055,126 B1, issued Feb. 28, 2006; effective filing date June 8, 1999) or Yoshimura (Yoshimura, N. et al., Cancer Letters, 164:155-160, 2001, March; cited in the IDS), and further in view of ATCC (ATCC Cell Lines and Hybridomas, 8th edition, 1994, page 100).

The Examiner states the combination of Galili with either Link, Jr. or Yoshimura teaches as set forth above with respect to claims 1-3 and 85. The Examiner states the combination of

Galili with either Link, Jr. or Yoshimura fails to teach a vaccine tumor cell composition of claim 1 where the cells are from A549 cells. The Examiner states, however, A549 cells are known in the art and are commercially available as evidenced by the 1994 ATCC catalog on page 100. The Examiner states, therefore, it would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have used A549 cells in the methods of either Link, Jr. or Yoshimura to make a pharmaceutical composition for inhibiting tumor growth, where the A549 cells have been transformed with an α-(1,3) galactosyltransferase encoding sequence to make cells that have αGal epitopes as taught by Galili. The Examiner states one would have been motivated to have used A549 cells because these are human lung cancer cells (see ATCC catalog, page 100) and transforming these cells would make them susceptible to antibody-mediated cell killing which would enhance the presentation of all of the lung tumor cell antigens to the hosts' immune system.

Applicants respectfully traverse this rejection. Even if Galili et al, the '126 patent or Yoshimura, were combined with the ATCC catalog, the combination would not have suggested the present invention to one skilled in the art because they do not teach all elements of the presently claimed methods. Neither the Galili reference, the '126 patent, Yoshimura, nor the ATCC catalog teaches or suggests a pharmaceutical composition of allogeneic human vaccine tumor cells as found in the Applicants' claims 1-4 and 85. Thus, the prior art references, alone or combined, fail to teach or suggest all the claim limitations of the present invention. Therefore, claims 1-4 and 85 are not obvious.

It respectfully submitted that the Examiner appears to be employing hindsight to arrive at the Applicants' invention, selecting aspects from at least four different references to attempt to piece together Applicants' invention. The Examiner is reminded that it is impermissible to use the

Applicants' specification as a template to arrive at the conclusion that the claimed invention is obvious and that the present invention must be considered as a whole. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicants' disclosure. In light of the above, Applicants submit that the present invention is not obvious by Galili et al, the '126 patent or Yoshimura, and the ATCC catalog.

In light of the foregoing, Applicant requests that the rejection to claims 1-4 and 85 under 35 U.S.C. §103 be withdrawn and reconsidered. Applicant submits that the claims are in form for allowance.

C. Claims 1 and 66 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Galili (Galili, U. et al., Journal of Hematotherapy & Stem Cell Research 10:501-511, 2001; cited in IDS) in view of Link, Jr., (Link, Jr. et al., US 7,055,126 B1, issued Feb. 28, 2006; effective filing date June 8, 1999) or Yoshimura (Yoshimura, N. et al., Cancer Letters, 164:155-160, 2001, March; cited in the IDS), and further in view of Berd (US 6,333,028; issued Dec. 25, 2001; effective filing Aug. 14, 1998).

The Examiner states, therefore, it would have been *prima facie* obvious to one of ordinary skill in the art to have modified the compositions that are taught by the combination of Galili with either Link, Jr. or Yoshimura, because the use of adjuvants for tumor cell-based vaccines in known in the art, and because adjuvants are known in the art to increase an immune response to components of vaccine compositions.

At the outset, Applicants have amended claim 1 to recite in part human allogeneic tumor cells. Support for this amendment may be found for example at paragraphs 135, 141, and 202 in the specification. As discussed above, the Galili et al reference, the '126 patent, and the Yoshimura reference do not teach a pharmaceutical composition of allogeneic human vaccine tumor cells as found in the Applicants' claim 1. Berd fails to supply the teachings that are lacking in the Galili et al reference, the '126 patent, and the Yoshimura reference. Clearly, the combination of references fail to teach or suggest the limitations of claim 1 and thus cannot render claim 1 obvious. Therefore, claim 66 depending from claim 1 is not obvious for the reasons argued above, plus the elements in the claims. In light of the foregoing, Applicant requests that the rejection to claim 1 under 35 U.S.C. §103 be withdrawn and reconsidered.

Double Patenting

Claims 1-5, 66, 67 and 85 stand provisionally rejected on the ground of Nonstatutory obviousness-type double patenting as being unpatentable over claims 1-14 of copending Application No. 11/013,685. The Examiner states that although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of Application No. 11/013,685 are drawn to a sub-genus of compositions encompassed by the claims of the instant application.

Applicants will be pleased to submit the Terminal Disclaimer upon the allowance of the present claims.

Conclusion

Please charge Deposit Account No. 26-0084 the amount of $100.00 for one new independent claim over 3. No other fees or extensions of time are believed to be due in connection with this amendment; however, consider this a request for any extension inadvertently omitted, and charge any additional fees to Deposit Account No. 26-0084.

Reconsideration and allowance is respectfully requested.

Respectfully submitted,

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- tdc/bjh -

Enclosures: Definitions of vaccine (2 pages)
132 Declaration, including Exhibits A and B

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- vacancy
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- vacate
- vacation
- vacationer
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- vaccinate
- ▶ **vaccine**
- vaccinee
- vaccinia
- vacherin
- vacillate
- vacua
- vacuity
- vacuolar membrane
- vacuolate

vaccine

vaccine

vac·cine [vak séen, vák sèen] (*plural* vac·cines)

noun

Definition:

1. inoculation: a preparation containing weakened or dead microbes of the kind that cause a disease, administered to stimulate the immune system to produce antibodies against that disease

2. protective software: a software program that protects a system against a computer virus

[Late 18th century. < Latin *vaccinus* "of a cow" < *vacca* "cow," because originally the cowpox virus used to prevent smallpox]

Word History

Vaccine was used by the British physician Edward Jenner at the end of the 18th century in the terms *vaccine disease*, meaning "cowpox," and hence

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— ORIGIN Latin *vaccinus*, from *vacca* 'cow' (because of the early use of the cowpox virus against smallpox).

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